

# The Clavicle Question: To Plate or Not to Plate



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# Clavicle Fractures to Plate or Not to Plate-Objectives



- What fractures benefit from fixation
- Non operative outcomes
- Operative outcomes



# Clavicle Fractures (Fxs)

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- Very common (2-4% of all adult fxs)
- Most frequent in young active individuals
- Midshaft fxs account for about 80% of all clavicle fxs
- Midshaft fractures traditionally treated non operatively

■ Canadian OTA, JBJS 2007

# Clavicle Fractures

## What we really know...

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- Skeletally immature patients universally heal, remodel, & do well
- Non/Minimally displaced clavicle fractures generally heal & do well



# Early reports of displaced midshaft clavicle fxs

- Nonunion rare (<1%)
- Malunion “radiographic interest only with no clinical importance”
  - McKee, R et al JBJS 2012



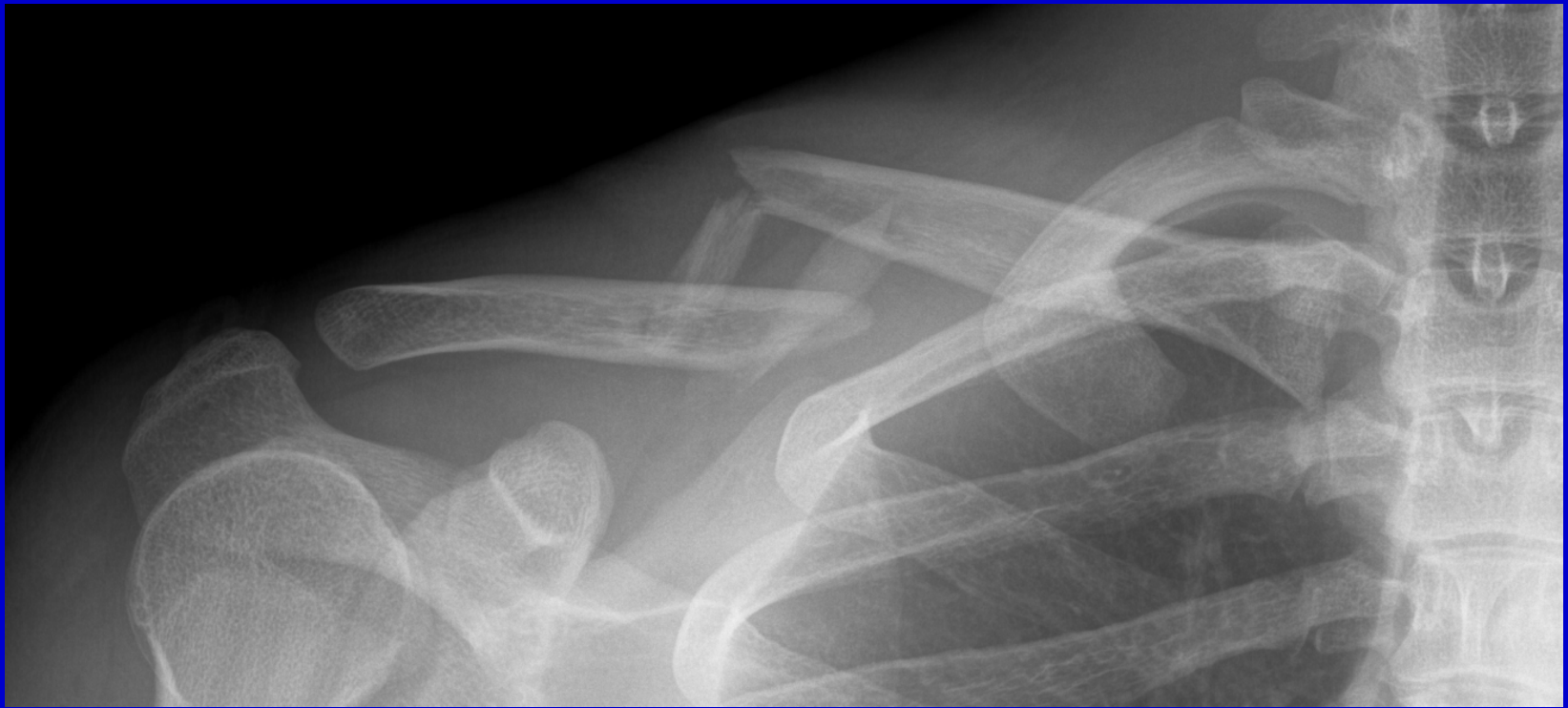
# Recent prospective studies of adults with displaced midshaft clavicle fxs

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- Nonunion not so rare (15-20%)
- Malunion was symptomatic
  - Shoulder muscle strength loss (18-33%) with poor early functioning of the shoulder
  - Residual sequelae in up to 42% six months after the injury

■ McKee, R et al JBJS 2012

# Displaced Midshaft Clavicle Fractures...Controversial



# Displaced Midshaft Clavicle Fxs-Treatment Options

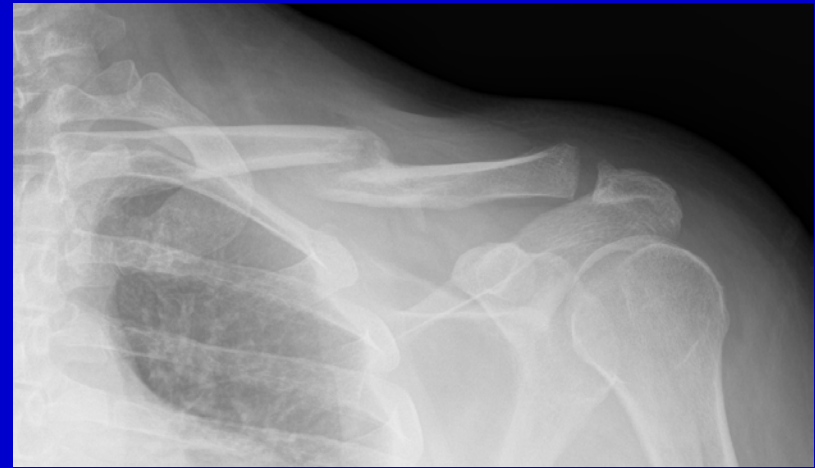


- Closed-Non Operative
  - Sling
  - Early ROM
- Operative
  - Open reduction internal fixation (ORIF)
    - Plate and Screw
    - Intramedullary fixation (percutaneous or ORIF)

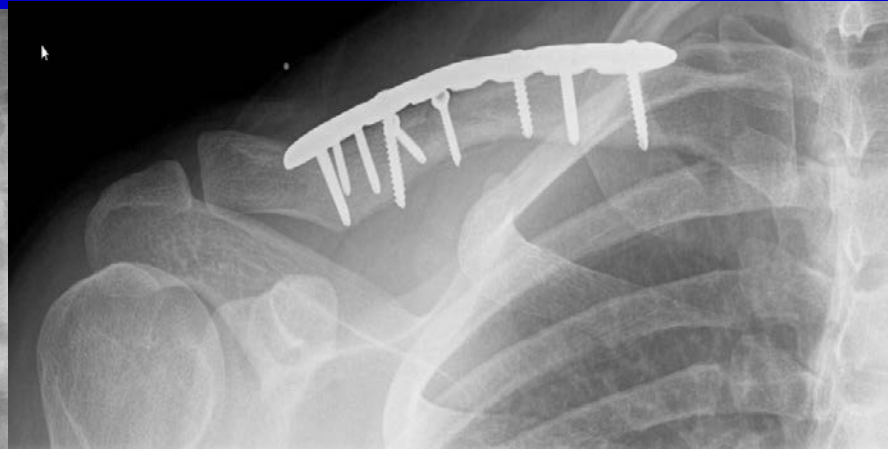


# Displaced Midshaft Clavicle

## Fxs-Closed Treatment



# Displaced Midshaft Clavicle Fxs-Operative Treatment



# Displaced Midshaft Clavicle Fractures



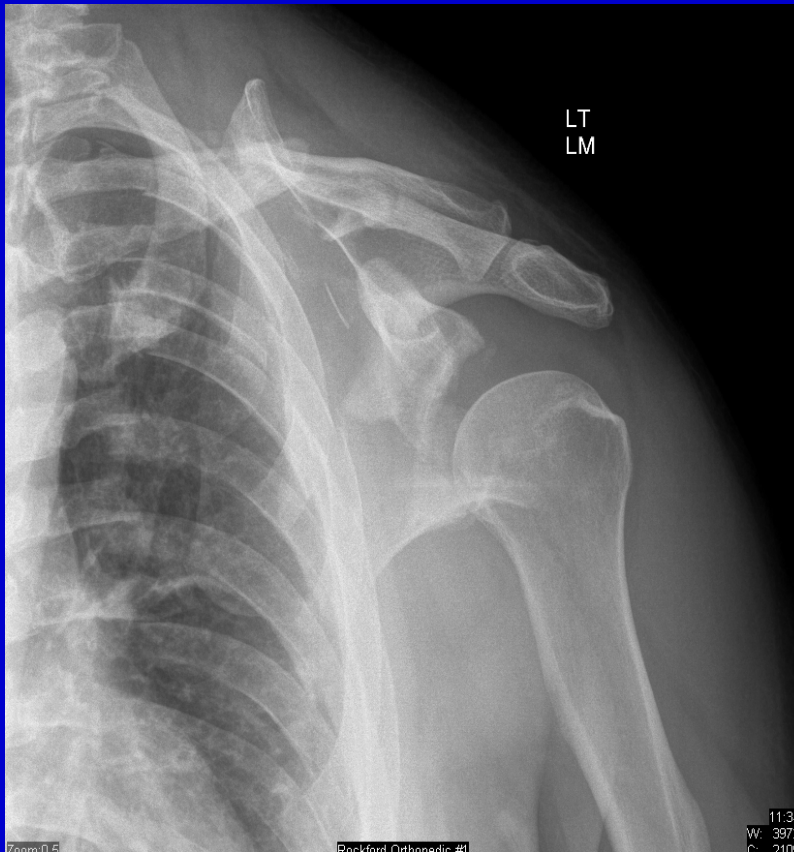
- Why not fix them all...?
- Bad “stuff” in proximity
  - Lung, brachial plexus, subclavian vessels
  - Mediastinal contents (potential catastrophic outcome with hardware migration)
- Potential problems with fixation
  - Subcutaneous bone with thin soft tissue envelope
    - Symptomatic hardware
    - Numbness/neuroma supraclavicular nerves
    - Difficult “bail out” if infection, wound problems, malunion, or nonunion

# Displaced Midshaft Clavicle Fractures



- Generally accepted fixation indications
  - Open fracture or impending open fracture
  - Ipsilateral floating shoulder/shoulder girdle injury
  - Scapulo-thoracic dissociation
  - Fx with progressive neurovascular compromise
  - Multi trauma with need to use/bear weight through the extremity

# Displaced Midshaft Clavicle Fractures-Fix this one!





# Displaced Midshaft Clavicle Fxs- What Does the Literature Say

- Old literature-no role for operative treatment, they all do well
- New literature-some role for operative treatment
  - Nonunions can be symptomatic
  - Malunions can cause pain & muscle weakness
    - McKee,M et al JBJS 2004



# *Nonoperative Treatment Compared with Plate Fixation of Displaced Midshaft Clavicular Fractures (DMCFx)*

- Multicenter, randomized, Level 1 evidence by the Canadian Orthopedic Trauma Association (JBJS 2007)
- Acute closed completely displaced mid 1/3 clavicle fxs in patients between 16-60yo
- 132 adult patients with DMCFx
  - 67 operative with plate ORIF (superior clavicle)
  - 65 non operative with sling



# *Nonoperative Treatment Compared with Plate Fixation of Displaced Midshaft Clavicular Fractures (DMCFx)*

- Time to radiographic union\*
  - Operative 16.4 weeks
  - Non operative 28.4 weeks
- Nonunion\*
  - Operative-2
  - Nonoperative-7
- DASH & Constant Shoulder Scores\* significantly improved at all time periods in the 1 year f/u
  - \* statistically significant





# *Nonoperative Treatment Compared with Plate Fixation of Displaced Midshaft Clavicular Fractures (DMCFx)*

- Symptomatic malunion\*
  - Operative-ZERO
  - Non operative-9
- Operative complications
  - Mostly hardware related
  - Symptomatic/prominent hardware-5
  - Wound infection-3
  - Mechanical failure-1

*Nonoperative Treatment Compared with Plate Fixation of DMCFx*

**Conclusions at 1 year follow up**

- **Satisfaction** in general with the shoulder & its appearance was **greater** in the **operative group vs non operative group**
- ORIF of DMSCFx results in **improved functional outcome & a lower rate of malunion/nonunion** compared with non operative treatment

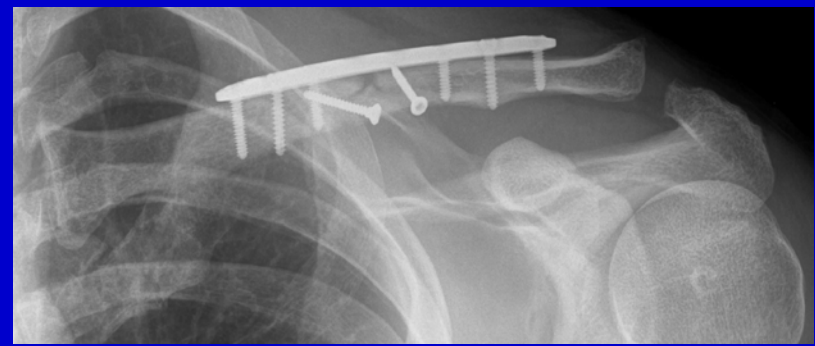
# Why Not Fix Them All...

18yo high school football player referred in with infected nonunion...did he need fixation?

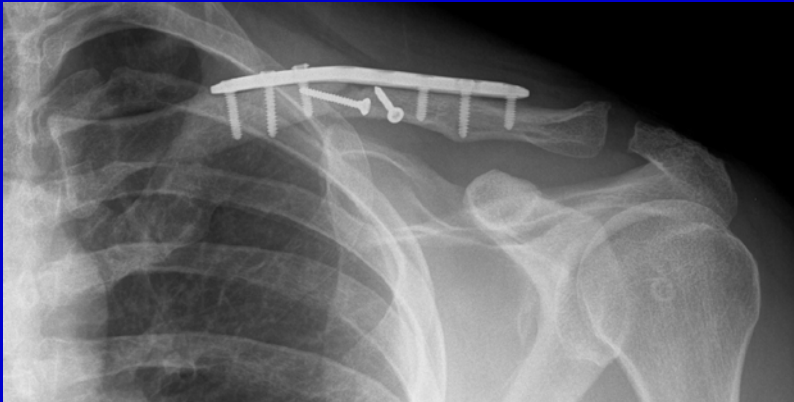


# Why Not Fix Them All...

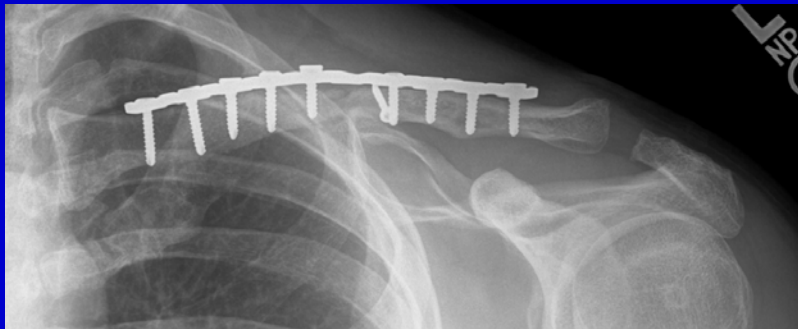
37yo fitness/weightlifting fanatic



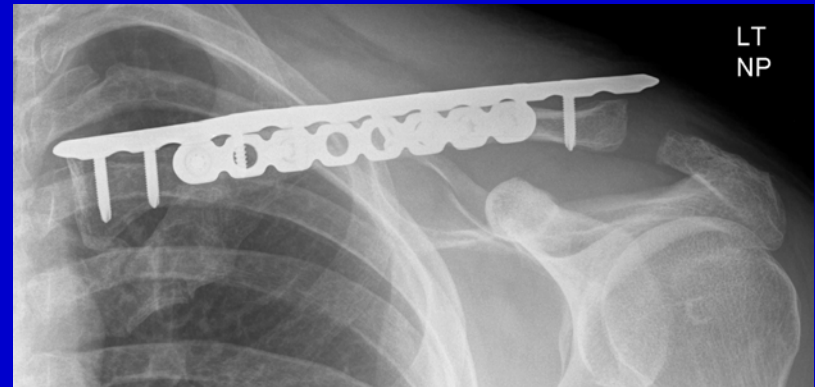
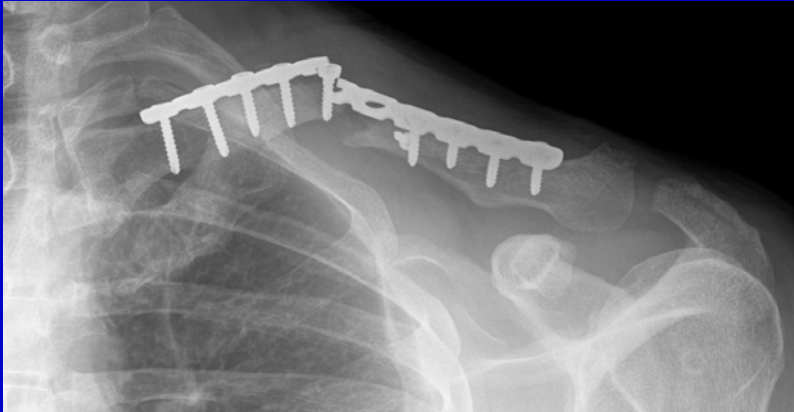
Early results were good...



If at first you don't succeed...

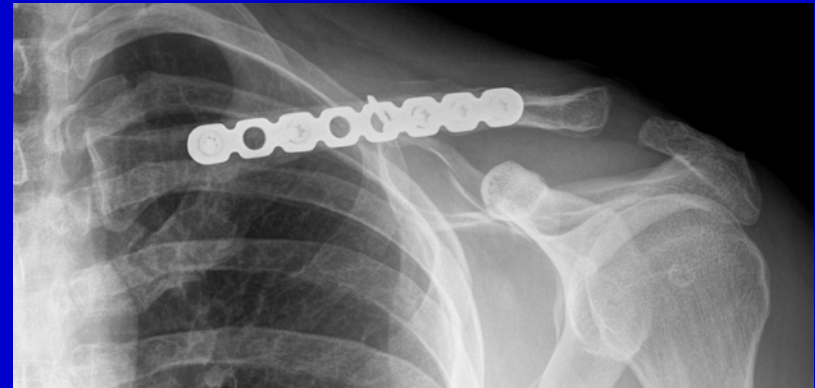


...try, try again

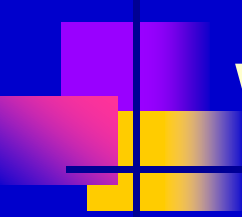


Finally, success (I think)

...after 4 operations over 2 years



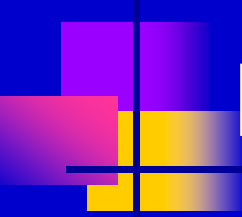




# If bad things can happen with ORIF, which fractures should we fix?

- **Prevent nonunion**
- Risk factors for nonunion
  - Female
  - Advanced age
  - Comminution
  - Displacement greater than 100%

■ Robinson et al JBJS 2004



# If bad things can happen with ORIF, which fractures should we fix to prevent **symptomatic malunion**?

- Risk factors for symptomatic malunion
  - Shortening
    - 18mm in males
    - 14mm in females
      - Lazarides,S J Shoulder Elbow Surg 2006
  - Comminution, increasing age, initial displacement (not shortening)
    - Nowak,J et al J Shoulder Elbow Surg 2004

# To plate or not to plate...?

44yo female



Referred to me 8 weeks post fracture  
not happy with her results



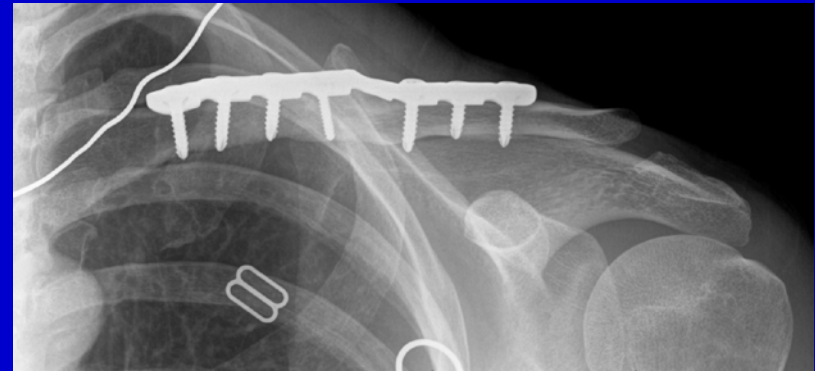
Perhaps it should have been  
fixed...



# Treat a patient, not an X-ray



# Osteotomy & Repair

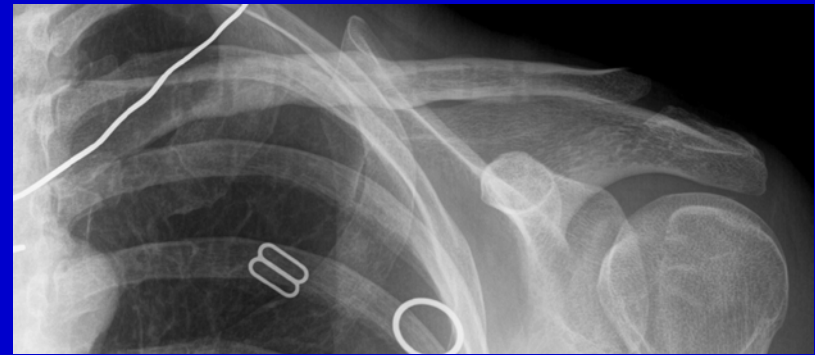


# Healed but Hardware was Symptomatic





# Final Result after Hardware Removal

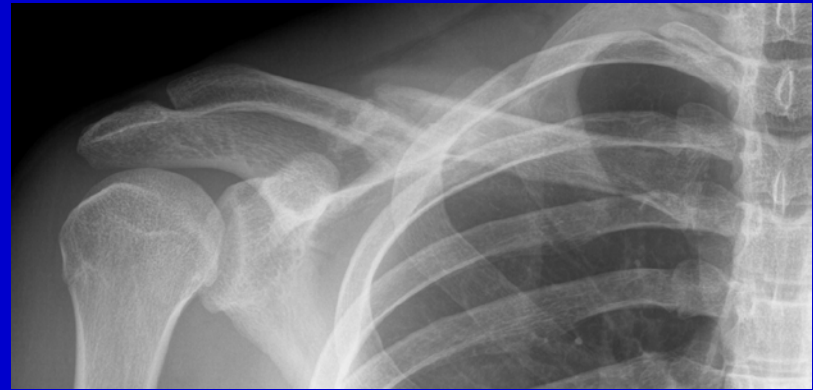


# Would you fix this fracture...?

19yo semi-pro football player



I recommended yes, he said no. He was right...painless full ROM 6 weeks post fx



Would you fix this fracture...?

54yo diabetic smoking male



How about if you were losing  
your insurance in 6 weeks...?



6 week results are good.





# DMCFxs-What Does the most recent Literature Say

- Operative Versus Nonoperative Care of Displaced Midshaft Clavicular Fractures: A Meta Analysis of Randomized Clinical Trials
- Systemic review of the literature found six level 1 randomized clinical trials
- ORIF/IM fixation vs non operative
  - McKee,R et al JBJS 2012



# *Operative Versus Nonoperative Care of DMCFxs: A Meta Analysis of Randomized Clinical Trials*

- **Nonunion & symptomatic malunion** rate was **higher** in **non operative** vs operative
- **Earlier functional return** in **operative** vs non operative
- **Marginally superior long term functional outcome** scores in operative vs non operative





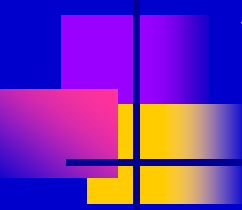
# *Operative Versus Nonoperative Care of DMCFxs: A Meta Analysis of Randomized Clinical Trials*

- Completely displaced midshaft clavicle fxs have a higher rate of nonunion & symptomatic malunion if treated non operatively
- No clear evidence that operative treatment will improve their long term function in general



# *Operative Versus Nonoperative Care of DMCFxs: A Meta Analysis of Randomized Clinical Trials*

- A subset of pts with completely displaced midshaft clavicle fxs will benefit from fixation (which ones...?)
- About 75% of non operatively treated completely displaced clavicle fxs will heal with few if any long term complications

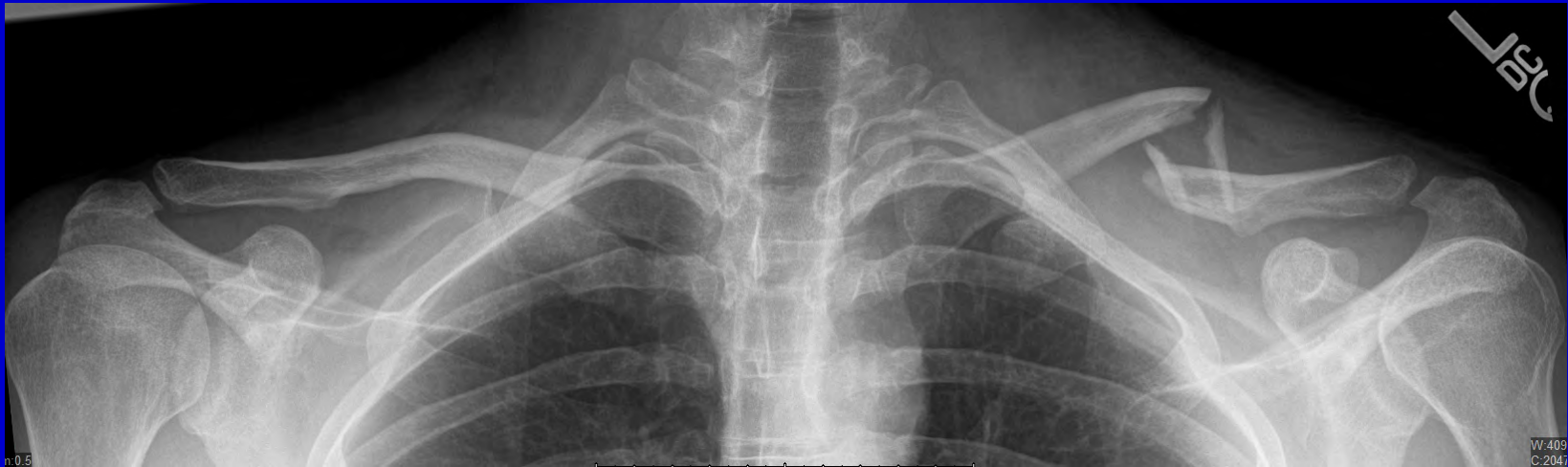


*Operative Versus Nonoperative Care of  
DMCFxs: A Meta Analysis of Randomized  
Clinical Trials-CONCLUSION*

“There is **little evidence** at present to show that **long-term functional outcome of operative intervention is significantly superior to nonoperative care**”

# To plate or not to plate...?

36yo active male



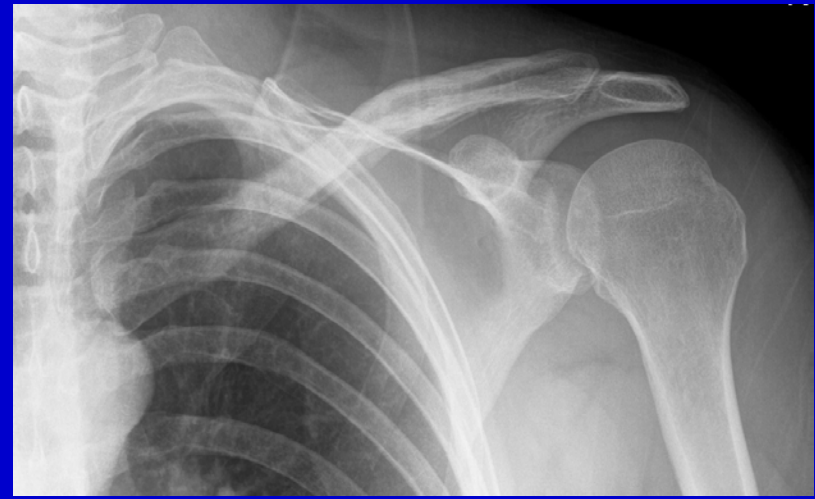
2 weeks post op



# Healed, but...



...delayed (>1 year) wound infection  
requiring hardware removal





# Isolated Displaced Midshaft clavicle fractures-Zussman's thoughts...

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- Some DMCFxs benefit from fixation
  - Significant displacement (vertical butterfly fragments)
  - Significant shortening
  - Significant tenting of the skin
  - Skeletally mature active patients
- I prefer plate fixation when I fix them





# Isolated Displaced Midshaft clavicle fractures-Zussman's thoughts...

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- Most operatively treated fxs heal & do well
- There will be anterior chest numbness
- The hardware may be symptomatic enough to require removal
- Complications can occur..."No problem is so bad that you can't make it worse with surgery"

# To plate or not to plate...?

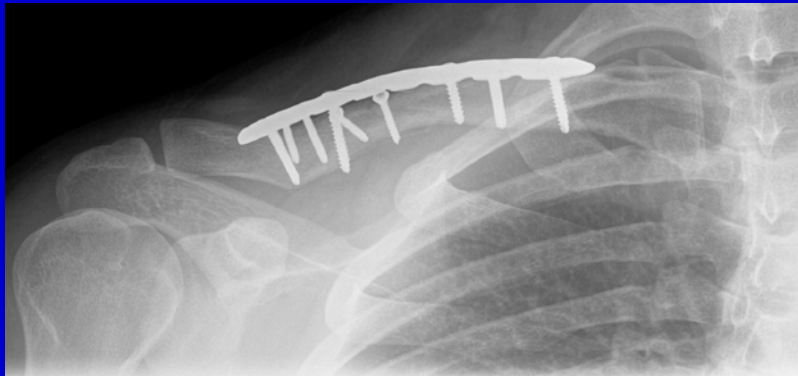
21yo male



# Immediate post op



# Final follow up, healed uneventfully





# The Clavicle Question: To Plate or Not to Plate-Summary

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- More studies are needed...
- Some DMCFxs benefit from fixation
- Plate fixation decreases nonunion & symptomatic malunion rates & gets earlier return to function
- Long term results of operative treatment are not necessarily superior to non-op treatment
- Treat a patient, not an X-ray



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# Thank You

THAT CONCLUDES MY  
TWO-HOUR PRESENTA-  
TION. ANY QUESTIONS?



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DID YOU INTEND THE  
PRESENTATION TO BE  
INCOMPREHENSIBLE,  
OR DO YOU HAVE SOME  
SORT OF RARE "POWER-  
POINT" DISABILITY?



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ARE THERE  
ANY QUESTIONS  
ABOUT THE  
CONTENT?



THERE WAS  
CONTENT?